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FEATURES OF THE INCREASED CONCENTRATION OF CARBON DIOXIDE IN THE ROOM ON THE HEALTH AND PERFORMANCE OF STUDENTS

Mirsagatova M.R,
Imamova A.O.,
Oblokulov A. G.,
Muxammadzokirov S.S,
Musalova L.
Tashkent Medical Academy

A B S T R A C T	K E Y W O R D S
After the implementation of the "Flower Island" project in the academic year in which I took part, more indoor plants appeared in school classrooms. We decided to find out if this benefited students and teachers who spend a lot of time in these classrooms, this was the subject of the research work "The effect of indoor plants on the concentration of carbon dioxide in the premises." We came across many articles on the impact of carbon dioxide on human health and performance. We became very interested in this issue also because it is a logical continuation of my previous works.	carbon dioxide, oxygen, pollutants, light, human health, plants, breath

Purpose of the Study

To reveal the dependence of students' well-being and working capacity on the concentration of carbon dioxide in the premises.

Tasks: to study literary sources on the research topic;

• prepare the necessary materials and equipment;

•to conduct an experiment;

• conduct correction tests for attention and memory;

• statistics on the incidence of acute respiratory infections and acute respiratory viral infections in 3rd grade students;

• analyze the obtained results and draw conclusions;

• make recommendations on the selection of the species composition of indoor plants for the premises and care for them;

Practical significance: the knowledge gained can be used in everyday life for competent landscaping of your apartments, growing types of indoor plants that most effectively purify the air from pollutants (carbon dioxide, etc.) By increasing the number of indoor plants in the premises, you can influence

the quality composition of the air. consequently, on the health, attention and performance of the inhabitants of these premises.

Used the following research methods:

• study of available information;
• analysis and systematization;
• experiment and observation;
• mathematical

Air is a mixture of various gaseous substances: nitrogen, oxygen, argon, carbon dioxide, water vapor and other gases. Oxygen is the most important part of the air for humans. Physiological changes in the human body occur if the oxygen content drops to 16-17%. At 11-13%, severe oxygen deficiency is observed, and at 7-8%, death may occur. Oxygen deficiency can occur indoors, where oxygen is replaced by carbon dioxide as a result of respiration. Carbon dioxide is colorless, odorless, 1.5 times heavier than air, so it can accumulate in the lower parts of enclosed spaces. It comes from people and animals that release it when they breathe. The maximum allowable amount of carbon dioxide content in a closed room should not exceed 1%. [1]

The atmosphere currently contains about 0.03% carbon dioxide and about 21% oxygen. At the same time, its slight decrease or increase will not have any effect on our body. But the change in carbon dioxide, unlike oxygen in one direction or another by only 0.1%, our body immediately reacts and tries to return it to normal. From this we can conclude that carbon dioxide is about 60-80 times more important than oxygen for our body. But for normal life activity, there should be 7-7.5% carbon dioxide in the blood, and 6.5% in the alveolar air.

The task of CO2 is to trigger the respiratory reflex. When its pressure rises, the network of thin nerve endings (receptors) immediately sends a message to the bulbs of the spinal cord and brain, the respiratory centers, from where the command to start the respiratory act follows. Therefore, carbon dioxide can be considered a watchdog signaling danger.

In the United States and in Europe, until recently, the degree of carbon dioxide content in a room was measured solely for the purpose of checking the quality of the ventilation system. At the same time, it was assumed that CO2 only in high concentrations is a threat to human health. As for the concentration of carbon dioxide of approximately 1000 ppm and its effect on our body, such studies have appeared relatively recently.

Few people know that the concentration of carbon dioxide in clean air outside of urban areas is about 400 ppm, which is optimal for human well-being. Residents of megacities are constantly exposed to the negative effects of excessive levels of CO2 in the air, being in public transport, in their own cars or at work.

Particular attention should be paid to the quality of the air that children breathe in classrooms. The concentration of carbon dioxide in the air of the classroom can increase several times by the end of the lesson.

High indoor CO2 levels cause symptoms such as eye and throat irritation, nasal congestion, headache and lack of sleep.

What happens when the concentration of CO2 in the air that enters the body increases? The partial pressure of CO2 in our alveoli increases, its solubility in the blood increases, and weak carbonic acid ($CO_2 + H_2O = H_2CO_3$) is formed, which, in turn, decomposes into H^+ and HCO_3^-. The blood acidifies, which is scientifically called acidosis. The higher the concentration of CO2 in the air we

constantly breathe, the lower the pH of the blood and the more acidic it is.

Children in high carbon dioxide classrooms often have difficulty breathing, shortness of breath, dry cough and rhinitis, and have a weakened nasopharynx, according to medical reports.

An increase in the concentration of carbon dioxide in the room leads to the occurrence of asthma attacks in asthmatic children.

Due to the increase in the concentration of carbon dioxide in schools, the number of absenteeism due to illness is increasing. Respiratory infections and asthma are major illnesses in these schools.

An increase in the concentration of carbon dioxide in the classroom negatively affects the learning outcomes of children, reduces their performance.

According to the results of last year's experiment, where we measured the concentration of carbon dioxide in classrooms of the second grades, we came to the conclusion that the highest concentration of carbon dioxide was observed in the classroom where the number of indoor plants was less. Therefore, we hypothesized that this affects the performance of students. To test our hypothesis, we decided to conduct a new experiment.

This technique is essentially similar to the Pieron-Ruser technique. It is intended to study the stability of attention, the possibilities of its switching, the study of the characteristics of the pace of activity, the ability to work into a task, the identification of signs of fatigue and satiety.

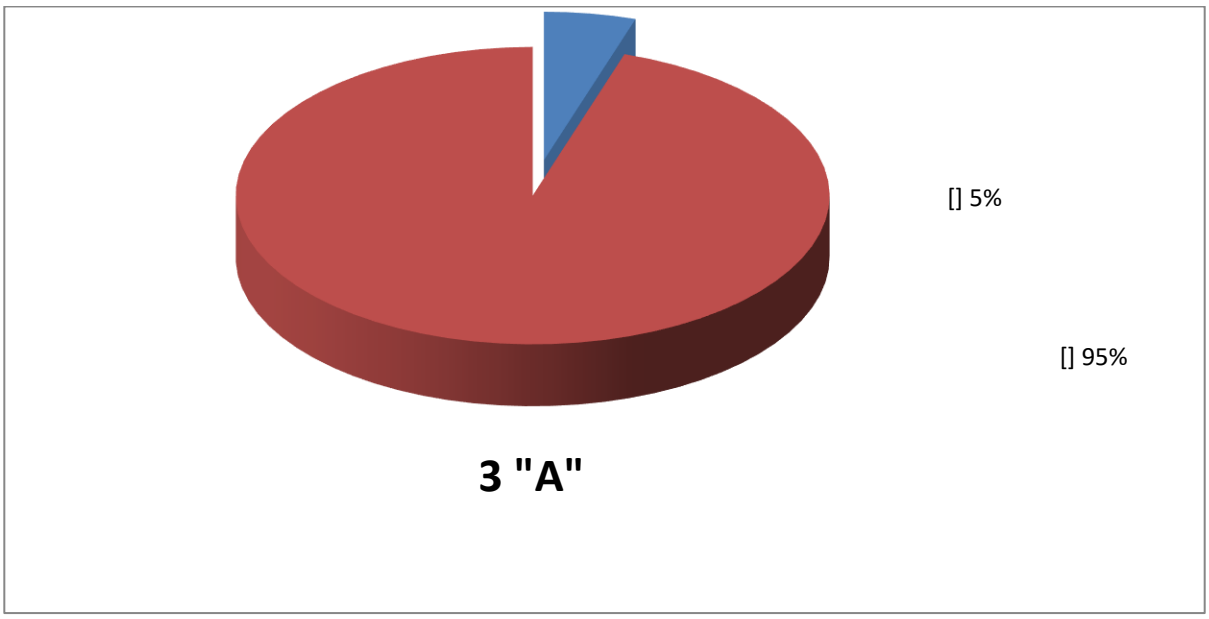
When working with a proof test, the child is asked to search for and cross out (highlight in a special way: underline, cross out, circle, etc.) 1-3 letters (for younger students, 3-4 letters (for older students). By the number of correctly crossed out letters, you can determine the degree of stability of attention, its volume. The distribution of errors throughout the sheet indicates fluctuations in attention: a noticeable increase in errors by the end of the work may indicate a weakening of attention due to fatigue (decrease in working capacity) or satiety; a uniform distribution of errors indicates a decrease in the stability of attention, the difficulty of its arbitrary concentration; the wave-like appearance and disappearance of errors indicates fluctuations or fluctuations in attention.

- the ability to retain instructions;
- tempo characteristics of activity;
- parameters of attention (stability, distribution and switching);
- number of mistakes;
- the presence of factors of satiety or fatigue.

Age features of use

The technique can be used when working with children who can recognize letters from the age of 7-8. At this age, normally, children correctly perform 3 characters (letters) almost to the end of the form. When a fourth character is added to highlight, either the pace of work drops sharply and satiety quickly sets in, or the child begins to make many mistakes. [3]

Results Measurements were taken after the third lesson. The results obtained were entered into the table.



The analysis showed: Since the classrooms had the same area, number of students, number of lessons, and differed only in the number of indoor plants that absorb carbon dioxide in the light, this gives us the opportunity to conclude that:

A high concentration of carbon dioxide leads to a decrease in the attention and performance of students.

The condition of the air in living and working spaces has a significant impact on our well-being. Houseplants can increase the humidity of the air, purify it of harmful substances and improve the microclimate of the room. It is very important to be able to choose the most effective of them.

It has been proven that, compared with outdoor air, the concentration of harmful substances in indoor air is 1.5-4 times higher. Of course, indoor plants are not able to completely clean the air of toxic substances: only a few dozen plants could cope with this task. However, it is possible to increase the humidity of the air and reduce the concentration of pollutants in the room by choosing the right types of plants for this.

Indoor plants can reduce the concentration of many air pollutants, including carbon dioxide.

By releasing oxygen, indoor plants ionize the air, and also increase the concentration of light ions, reducing the concentration of heavy ions. Light negative ions, which are so few in polluted air, are necessary for our life: they improve the activity of respiratory enzymes and metabolism, the acid-base balance of the blood, strengthen the immune system, increase muscle tone, and prevent high blood pressure.

Conclusions

It is well known that one person in a calm state, for example, an office worker, consumes 20–30 liters of oxygen per hour with the release of 18–25 liters of carbon dioxide, and when exercising in fitness and gyms - up to 36 liters or more. If the inhaled air contains 0.03% (vol.) CO2, then the exhaled air contains 3.6% (vol.), that is, it increases by more than 100 times!

Recent studies by foreign scientists have shown that carbon dioxide adversely affects the human body, even in low concentrations. In 2006, Italian scientists conducted research in five EEC countries. The results showed that 68% of children are negatively affected by CO2 above the level of 0.1%. They

experienced heavy breathing, shortness of breath, dry cough and rhinitis more often than other children. The following conclusions were made: children who are in a room with a high level of CO2 are 3.5 times more likely to develop dry cough and 2 times more likely to develop rhinitis. They have a more vulnerable nasopharynx than their peers. [6]

You can solve this problem:

First, with the help of indoor plants.

Secondly, teachers need to regularly ventilate classrooms, and in warm weather, carry out cross-ventilation, according to the recommended duration of cross-ventilation of classrooms, depending on the outdoor temperature. [7]

Such recommendations are in our school in every class and teachers try to follow them.

Based on the experimental results, we were able to draw the following conclusions:

A high concentration of carbon dioxide leads to a decrease in the attention and performance of students.

Therefore: the first hypothesis was fully confirmed.

The second hypothesis was also confirmed.

An increased concentration of carbon dioxide in classrooms leads to an increase in the number of ARVI and acute respiratory infections.

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